

- 1 1. A node element for use in assembling a plurality of structural elements comprising:
 - 2 a body;
 - 3 one or more connection ports disposed relative to the body, at least one connection port
 - 4 capable of being coupled to an adjacent structural element; and
 - 5 a computational unit disposed within the body, wherein the computational unit receives
 - 6 information of physical characteristics of the node element from the connection port.
- 1 2. The node element of claim 1 further comprising a communications device capable of
- 2 providing node element information.
- 1 3. The node element of claim 1 wherein the adjacent structural element comprises a bond
- 2 element.
- 1 4. The node element of claim 1 wherein the computational unit uses the information of physical
- 2 characteristics to determine a topology of the node element.
- 1 5. The node element of claim 4 wherein the information of physical characteristics is obtained
- 2 from a sensor disposed within the node element.
- 1 6. The node element of claim 1 further comprising a sensor that detects information about at
- 2 least one of movement of the node element with respect to a bond element, rotational orientation
- 3 with respect to the connection port, movement of the node element with respect to one of the
- 4 structural elements, position or movement of the node element with respect to an external spatial
- 5 orientation reference point, and physical stress upon the node element.
- 1 7. The node element of claim 6 wherein the sensor comprises at least one of a rotational sensor,
- 2 an accelerometer, a compass, an inclinometer, a magnetometer, and a gyroscope.
- 1 8. The node element of claim 6 wherein the computational unit receives the information of
- 2 physical characteristics from the sensor.

- 1 9. The node element of claim 6 wherein the sensor stores or provides information of changes in
2 physical characteristics of the node element.
- 1 10. The node element of claim 1 further comprising a control device that manipulates a physical
2 characteristic of the connection port.
- 1 11. The node element of claim 10 wherein the control device comprises an actuator, a vibrating
2 unit, or a light emitting diode.
- 1 12. The node element of claim 2 wherein the communications device transfers data from the
2 computational unit to one of the structural elements.
- 1 13. The node element of claim 2 wherein the communications device provides data from the
2 computational unit to an external computer system.
- 1 14. The node element of claim 13 wherein the communications device exchanges information
2 between the external computer system and the computational unit.
- 1 15. The node element of claim 2 further comprising a power transmission interface capable of
2 transferring power from an external source through at least one of the connection ports and to the
3 node element.
- 1 16. The node element of claim 2 wherein the communications device comprises a wireless
2 transmitter.
- 1 17. A bond element for use in assembling a plurality of structural elements comprising:
2 a body;
3 a first and a second connection port disposed relative to the body, at least one of the first
4 and the second connection ports capable of being coupled to an adjacent structural
5 element; and

6 a computational unit disposed within the body, wherein the computational unit receives
7 information of physical characteristics of the bond element from the first or second
8 connection ports.

1 18. The bond element of claim 17 further comprising a sensor that detects information about at
2 least one of movement of the bond element with respect to a structural element, rotational
3 orientation with respect to the connection port, position or movement of the bond element with
4 respect to an external spatial orientation reference point, and physical stress upon the bond
5 element.

1 19. The bond element of claim 18 wherein the sensor comprises at least one of a rotational
2 sensor, an accelerometer, a compass, an inclinometer, a magnetometer, and a gyroscope.

1 20. A hybrid modeling system comprising:

2 a physical model comprising at least one node element capable of being coupled to a
3 structural element, the node element comprising a computational unit including
4 information of physical characteristics of the node element; and

5 a virtual model stored on a computer system, wherein the information of physical
6 characteristics of the node element is electronically provided from the physical model to
7 the virtual model.

1 21. The modeling system of claim 20 wherein the information of physical characteristics relates
2 to a topology of the node element.

1 22. The modeling system of claim 20 wherein the computational unit of the node element
2 receives the information of physical characteristics from a sensor disposed within or connected
3 to the node element.

1 23. The modeling system of claim 22 comprising a software program running on the
2 computational unit and in communication with a software program running on the computer
3 system of the virtual model.

1 24. The modeling system of claim 23 wherein the software program of the computer system
2 includes a graphic display visualization unit.

1 25. The modeling system of claim 24 wherein the visualization unit presents to a user a graphic
2 display of at least a portion of the physical model, at least a portion of the virtual model, or at
3 least portions of the physical and virtual models.

1 26. The modeling system of claim 24 wherein the visualization unit displays at least one of
2 structure information, energetic information, and physical properties of the hybrid model.

1 27. The modeling system of claim 20 further comprising a communications system that provides
2 information from the computer system of the virtual model to the computational unit of the
3 physical model.

1 28. The modeling system of claim 27 wherein the information provided to the node element
2 from the computer system actuates a control device disposed within or adjacent to the node
3 element.

1 29. The modeling system of claim 28 wherein the information is wirelessly communicated from
2 the computer system .

1 30. The modeling system of claim 28 wherein the actuation of the control device corresponds to
2 a virtual characteristic of the virtual model.

1 31. A structural modeling kit for use in assembling a plurality of structural elements comprising:

2 at least one bond element comprising:

3 a body; and

4 a first and a second connection port disposed relative to the body of the bond
5 element; and

6 at least one node element comprising:

7 a body;

8 a node connection port disposed relative to the body of the node element, capable
9 of being coupled to the bond element; and

10 a computational unit disposed within the body of the node element, wherein the
11 computational unit receives information of physical characteristics of the node
12 element from the node connection port.

1 32. The modeling kit of claim 31 wherein the node elements and the bond elements are coupled
2 to correspond to at least a portion of a molecular model.

1 33. The modeling kit of claim 31 wherein at least one of the node element or the bond element
2 comprises a communications device capable of providing the information of physical
3 characteristics to an external computer system.

1 34. A method of incorporating physical information into a virtual model comprising:

2 providing a modeling system including:

3 a physical model comprising at least one node element capable of being coupled
4 to a structural element, the node element comprising a computational unit
5 including information of physical characteristics of the node element; and

6 a virtual model stored on a computer system;

7 electronically providing the information of physical characteristics of the node element
8 from the physical model to the virtual model.